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**Education**

- Ph.D., Computer Science and Applications, Virginia Tech, Blacksburg, VA 8/93 - 9/97  
Dissertation: Parallel sparse linear algebra for homotopy methods (Adviser Layne T. Watson)
- B.S., M.S., Programming Theory and Applied Mathematics, Kiev State University, Kiev Ukraine 9/87 - 6/92

**Research interests**

- High-performance computing
- Parallel numerical algorithms for large-scale linear and non-linear systems
- Performance and scalability analysis
- Distributed computing and networks

**Professional Experience**

- Scientist, Ames Laboratory US Department of Energy, IA May 2003 – present.
- Adjunct Associate Professor, Department of Computer Science, Iowa State University, IA Sep. 2003 – present.
- Associate Professor, Department of Computer Science, University of Minnesota Duluth, MN Sep. 2002 – present.
- Assistant Professor, Department of Computer Science, University of Minnesota Duluth, MN Dec. 1997 – Aug. 2002

Published papers, obtained external funding, participated in scientific meetings, supervised graduate students and independent study undergraduate projects, developed and taught Computer Science graduate and undergraduate courses, served on the departmental search committee.

Served as a Principal Investigator at the Minnesota Supercomputing Institute, Minneapolis, MN Sep. 2000 – present.

- Research Associate, Ames Laboratory US Department of Energy, IA Sept. 1999 – Dec. 1999.

Designed and tested the adaptive capabilities of sparse linear algebra algorithms in distributed computing cluster environments such as clusters of PCs using Fast Ethernet and IBM SP cluster using Gigabit Ethernet.

- Research Associate, Computer Science Department, Virginia Tech, VA Jun. 1999 – Jul. 1999; Sept. 1997 – Dec. 1997.

Conducted research under grant “Iterative solution of sparse linear systems in tire design” from Michelin Americas Research & Development Corporation.

- Post-doctoral Associate, Department of Computer Science and Engineering, University of Minnesota, MN Jun. 1998 – Aug. 1998.

Constructed parallel techniques based on domain decomposition ideas for solving partial differential equations and implemented algorithms in PPARSLIB, a software package for parallel solution of large-scale linear systems under supervision of Dr. Yousef Saad.

- Consultant, Michelin Americas Research & Development Corp., SC Oct. 1996, Dec. 1996, May – Aug. 1997.  
Made on-site visits and presentations for the algorithm development group. Collaborated with Mr. John Melson.
- Graduate Research Assistant, Computer Science Department, Virginia Tech, VA May 1994 – Aug. 1997.  
Developed techniques and contributed to mathematical software package (HOMPACK90) for nonlinear analysis under Dr. Layne Watson.
- Graduate Teaching Assistant, Computer Science Department, Virginia Tech, VA Aug. 1993 – May 1994.  
Conducted recitation sessions for introductory Computer Science course.

### **Publications: Journals**

1. Ph. Guillaume, Y. Saad, and M. Sosonkina, *Rational approximation preconditioners for general sparse linear systems*, Journal on Computational and Applied Mathematics, accepted 2003.
2. M. Sosonkina, Y. Saad, and X. Cai, *Using the Parallel Algebraic Recursive Multilevel Solver in Modern Physical Applications*, Future Generation Computing, Special Issue on Modern Numerical Algorithms, accepted 2002.
3. Z. Li, Y. Saad, and M. Sosonkina, *pARMS: a parallel version of the algebraic recursive multilevel solver*, Numerical Linear Algebra with Applications, accepted 2002.
4. M. Sosonkina, D.C.S. Allison, and L.T. Watson, *Scalability analysis of parallel GMRES implementations*, Parallel Algorithms and Applications, 17 (2002) pp 285–299.
5. M. Sosonkina, J. T. Melson, Y. Saad, and L. T. Watson, *Preconditioning strategies for linear systems arising in tire design*, Numerical Linear Algebra with Applications, 7 (2000), pp. 743–757.
6. M. Sosonkina, D.C.S. Allison, and L.T. Watson, *Parallel adaptive GMRES implementations for homotopy methods*, SIAM J. Optimization, 9 (1999) pp. 1149–1158.
7. Y. Saad and M. Sosonkina, *Distributed Schur complement techniques for general sparse linear systems*, SIAM J. Scientific Computing, 21 (1999), pp. 1337–1356.
8. Y. Saad, M. Sosonkina, and J. Zhang, *Domain decomposition and multi-level type techniques for general sparse linear systems*, Contemporary Math., 218 (1998), pp. 174–190.
9. M. Sosonkina, L.T. Watson, R.K. Kapania, and H. F. Walker, *A new adaptive GMRES algorithm for achieving high accuracy*, Numerical Linear Algebra with Applications, 5 (1998) pp. 275–297.
10. L.T. Watson, M. Sosonkina, R.C. Melville, A.P. Morgan, and H.F. Walker, *HOMPACK90: A suite of Fortran 90 codes for globally convergent homotopy algorithms*, ACM TOMS, 23 (1997), pp. 514–549.
11. M. Sosonkina, L.T. Watson, and D.E. Stewart, *Note on the end game in homotopy zero curve tracking*, ACM TOMS, 22 (1996), pp. 281–287.

## Publications: Refereed Proceedings

1. X. Cai and M. Sosonkina, *A Numerical Study of Some Parallel Algebraic Preconditioners*, Proceedings of IPDPS 2003, Nice April 2003.
2. D. Kulkarni and M. Sosonkina, *Using dynamic network information to improve the runtime performance of a distributed sparse linear system solution*, High Performance Computing for Computational Science – VECPAR 2002, J. M.L.M Palma, J. Dongarra, Vicente Hernandez, and A.A. Sousa (eds), Lecture Notes in Computer Science, 2565, Springer-Verlag, Berlin, 2002, pp. 436 – 451.
3. X. Cai, Y. Saad, and M. Sosonkina, *Parallel iterative methods in modern physical applications*, Computational Science - ICCS 2002, P.M.A. Sloot, C.J.K. Tan, J.J. Dongarra, and A.G. Hoekstra, (eds), Lecture Notes in Computer Science, 2330, Springer-Verlag, Berlin, 2002, pp. 345–355.
4. G. Mateescu, M. Sosonkina, and P. Thompson, *A new model for probabilistic information retrieval on the web*, Workshop on Web Analytics, Ghosh, J. and Srivastava, J. (eds), Second SIAM International Conference on Data Mining, Arlington, VA, 2002, pp. 17–27.
5. Y. Saad and M. Sosonkina, *pARMS: a Package for solving general sparse linear systems of equations*, Parallel Processing and Applied Mathematics, R. Wyrzykowski, J. Dongarra, M. Paprzycki, and J. Wasniewski (eds), Lecture Notes in Computer Science, 2328, Springer-Verlag, Berlin, 2002, pp. 446–457.
6. D. Kulkarni and M. Sosonkina, *Minimizing communication waiting time in sparse linear system solution using dynamic network information*, Proceedings of The 2002 International Conference on Communications in Computing, CIC’02, Las Vegas June 2002.
7. D. Kulkarni and M. Sosonkina, *Dynamic network information collection for distributed scientific application adaptation*, International Conference on High Performance Computing, HiPC 2002, Bangalore India, December 18–21, 2002.
8. M. Sosonkina and G. Chen, *Design of a tool for providing network information to an application*, Parallel Computing Technologies, PaCT’2001, V. Malyshev (eds), Lecture Notes in Computer Science, 2127, Springer-Verlag, Berlin, 2001, pp. 350–358.
9. M. Sosonkina, *Runtime adaptation of an iterative linear system solution to distributed environments*, Applied Parallel Computing, PARA’00, T. Sorevik and F. Manne and R. Moe and A. H. Gebremedhin (eds), Lecture Notes in Computer Science, 1947, Springer-Verlag, Berlin, 2001, pp. 132–140.
10. Y. Saad and M. Sosonkina, *Non-standard parallel solution strategies for distributed sparse linear systems*, ACPC’99, P. Zinterhof, et al. (eds), Lecture Notes in Computer Science, Springer-Verlag, Berlin, March 1999, pp. 13–27.
11. M. Sosonkina, J. Melson, and L.T. Watson, *Iterative solution of large linear systems arising in tire design*, Modeling and Simulation Based Engineering, S. N. Atluri et al. (eds), Vol. 1, Tech Science Press, 1998, pp. 473–478.
12. M. Sosonkina, D.C.S. Allison, and L.T. Watson, *Scalable parallel implementations of the GMRES algorithm via Householder reflections*, 1998 Int’l Conf. on Parallel Processing, T. H. Lai (ed), IEEE Computer Society, Los Alamitos, CA, 1998, pp. 396–404.
13. Y. Saad and M. Sosonkina, *Solution of distributed sparse linear systems using PPARSLIB*, Applied Parallel Computing, PARA’98, B. Kaagstrom et al. (eds), Lecture Notes in Computer Science, 1541, Springer-Verlag, Berlin, 1998, pp. 503–509.

## **Publications: non-refereed proceedings and technical reports**

1. D. Kulkarni and M. Sosonkina, *Using dynamic network information to improve the runtime performance of a distributed sparse linear system solution*, Report UMSI-2002-10, Minnesota Supercomputer Institute, University of Minnesota, Minneapolis, MN, 2002; accepted in VECPAR 2002.
2. Y. Saad and M. Sosonkina, *Enhanced preconditioners for large sparse least squares problems*, Report UMSI-2001-1, Minnesota Supercomputer Institute, University of Minnesota, Minneapolis, MN, 2001; submitted to ETNA 2002.
3. Z. Li, Y. Saad, and M. Sosonkina, *Parallelism in algebraic recursive solvers*, In Proc. 10th SIAM Conference on Parallel Processing for Scientific Computing, SIAM, Philadelphia, PA, 2001.
4. Y. Saad and M. Sosonkina, *Enhanced parallel multicolor preconditioning techniques for linear systems*, In Proc. 9th SIAM Conference on Parallel Processing for Scientific Computing, SIAM, Philadelphia, PA, 1999.
5. M. Sosonkina, D.C.S. Allison, L.T. Watson, *Scalability of an adaptive GMRES algorithm*, In Proc. 8th SIAM Conference on Parallel Processing for Scientific Computing, SIAM, Philadelphia, PA, 1997.

## **Awarded Grants**

1. National Science Foundation Grant [NSF/ACR – 0305120] “Parallel Large-Scale Sparse Linear System Solvers: New methods and Paradigms”, Co-principal investigator, 06/01/2003 – 05/31/2006, \$350,000.
2. National Science Foundation Grant [NSF/ACR – 0000443] “Algebraic Recursive Multilevel Solvers: Advances in Scalable and Robust Parallel Linear System Solution Methods”, Co-principal investigator, 06/01/2000 – 05/31/2003, \$469,839.
3. National Science Foundation Grant [NSF/INT – 0003274] “Robust Parallel Preconditioning Methods: Bridging the gap between direct and iterative methods”, NSF-INRIA (France) collaboration, Co-principal investigator, 06/01/01 – 05/31/2004, \$36,000.
4. WISC travel grant funded by NSF “High-performance Computing for Simulation of Complex Objects in Energetics, Economics, and Ecology”, NSF-IPME (Ukraine) collaboration, Principal investigator, 12/2002 – 01/2003 \$3,110.
5. Grant-in-Aid of Research; University of Minnesota, “Parallel solution of large-scale general linear systems”, Principal investigator, 12/97 – 11/99, \$17,271.
6. University of Minnesota international travel grants for contributed paper presentations at VECPAR’2002 (Portugal), PARA’2000 (Norway), and PARA’98 (Sweden), \$1,800.
7. Association of Women in Mathematics travel grant for poster presentation at Olga Taussky Todd Celebration, Berkeley July 1999, \$1,000.

## **Invited Talks**

Sandia National Laboratories, Albuquerque NM Jul. 2001

University of Oslo, Oslo Norway Jun. 2001

Stanford University, Palo Alto CA Dec. 2000

CERFACS, Toulouse France Jun. 2000, Jun. 2001, Jun. 2002

United Technologies, Hartford CT Oct. 2000

Computation Center, Iowa State University, Ames IA Oct. 1999

Lawrence Berkeley National Laboratory, Berkeley CA Jul. 1999

Ames Laboratory, Ames IA Apr. 1999, Oct. 2001

Dartmouth College, Computer Science Department, Dartmouth NH Aug. 1998

Exxon-Mobil Corporation, Dallas TX Dec. 1997

Los Alamos National Laboratory, Los Alamos NM Aug. 1997

### Conference presentations with non-published proceedings

1. *Parallel direct and iterative methods: a comparison*, 2nd St. Girons Conference “Sparse days and Grid computing”, St Girons France Jun. 2003
2. *Parallel solution of a general sparse linear system using pARMS*, 11th Copper Mountain Conference on Iterative Methods, Copper Mountain CO Apr. 2002
3. *Enhanced preconditioners for large sparse least squares problems*, Preconditioning 2001, Tahoe City CA Apr. 2001
4. *Rational approximation preconditioners for sparse linear systems*, Tenth Copper Mountain Conference on Iterative methods, Copper Mountain CO Apr. 2000
5. *Enhanced preconditioners for large sparse least squares problems*, SIAM Linear Algebra Conference, Raleigh NC, Oct. 2000
6. *A case study of a resource-aware parallel linear system solution*, Poster presentation, SuperComputing’99, Portland OR Nov. 1999
7. *Application of iterative solution techniques in tire design*, Poster presentation, Olga Taussky Todd Celebration Conference, Berkeley Jul. 1999
8. *Preconditioning strategies for linear systems arising in tire design*, Preconditioning Techniques for Industrial Applications (Sparse 99), Minneapolis MN Jun. 1999
9. *Distributed multilevel Schur complement preconditioning of general sparse linear systems*, Eight Copper Mountain Conference on Multigrid, Copper Mountain CO, Apr. 1999
10. *Distributed Schur complement preconditioning for general sparse linear systems*, Ninth Copper Mountain Conference on Iterative methods, Copper Mountain CO Apr. 1998

### Applications Workshop Participation

- Modeling and Simulating Biocomplexity, Santa Fe Research Institute, NM Aug. 2002
- Sandia CSRI Workshop on Numerical Aspects of Circuit and Device Modeling, Santa Fe NM Apr. 2001

### Professional Activities

- Member: Sigma Xi, The Scientific Research Society, SIAM, IEEE Computer Society, Association of Women in Mathematics.
- Reviewer for scientific journals:
  - SIAM Journal on Scientific Computing
  - Numerical Linear Algebra with Applications
  - ACM Transactions on Mathematical Software
  - IEEE Transactions on Parallel and Distributed Systems
- Reviewer for grant proposals: National Science Foundation panel participant, May 2000.
- Member of search committee in the Computer Science Department.

## **Courses Developed and Taught**

- Undergraduate Courses:

Computer Networks (6 times), Computer Organization (5 times), Computer Architecture (3 times).

- Graduate Courses:

Computational Grids (1 time), Advanced Computer Architecture (1 time), Parallel and Distributed Computing (1 time) Graduate Seminar “Mobile Computing” (1 time).

## **Master’s Theses Supervised <sup>1</sup>**

1. Vishwas Raman, “A high-throughput computing system with user-initiated checkpointing”, May 2000 (co-advised).
2. Purushottam Kulkarni, “Some methods for parallelizing decision tree learning”, May 2000 (co-advised).
3. Gan Chen “Providing dynamic network information to distributed applications”, May 2001.
4. Anand Nagarajan, “Distributed graph coloring algorithms in linear systems”, May 2001.
5. Deepa Krishnamoorthy, “Experiments with parallel algebraic multilevel solvers for solving very large sparse linear systems”, expected May. 2003.
6. Devdatta Kulkarni, “Integration of dynamic network information into distributed scientific applications”, May 2002.

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<sup>1</sup>The Computer Science Department has a graduate program on Master’s level only.